 '62 Geo.

MULTIPLE IMAGE CORRELATOR EVALUATION PROGRAM

To Exploit Its Full Potential Through Development of Optimum Operational Procedures and Specifications for Input Sensor Materials and Correlator Improvements

Proposed as Task Order No. 5 to [redacted] STAT

May 1962

Revised 27 September 1962

[redacted] STAT

MULTIPLE IMAGE CORRELATOR EVALUATION PROGRAM
Proposed Task Order No. 5

I. INTRODUCTION

Under Task Order No. 2 of Contract [redacted] recently brought to successful completion the development of a Multiple Image Correlator, Mark I. The purpose of the correlator is to improve the definition of extremely small or greatly subdued photo images by precisely aligning from two to eight transparencies of essentially identical* exposures, then photographing and viewing the result. The transparencies are first given a rough visual alignment, and they are then aligned accurately by electronic circuitry. The reference transparency and the transparency to be aligned with it are scanned simultaneously by a flying spot generated by a cathode ray tube (CRT). The correlator's operator observes the signals which result from the scanning operation on the face of an oscilloscope, and uses this information to orient the transparency to be aligned in x, y, and θ (rotational alignment).

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To exploit the full potential of the correlator, [redacted] proposes to undertake a modest engineering study. The primary purpose of this study will be to evaluate alternative methods of using the correlator and to develop optimum operational procedures. Important by-products of the study will be performance specifications which should be imposed on sources and sensors providing input photographs for the correlator, and a relatively complete set of design specifications for a more advanced image correlation system. The scope of the study is outlined in detail below.

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*The term "identical" is used here to describe photographs of the same object taken from the same point at approximately the same time.

II. SCHEDULE

A. Scope of Work

The contractor shall examine in detail four principal aspects of the Multiple Image Correlator, Mark I to exploit its full potential.

1. Operational Techniques

[redacted] shall examine and develop techniques for accommodating representative inputs from a variety of cameras and photographing conditions (e. g., cases of the same basic geometry and scale, but perhaps different lighting). The representative inputs shall consist of sets of government furnished photography. [redacted] will determine optimum means of treating each set or group of problems presented by the sets. An analysis of limiting cases will also be made for each set. STAT STAT

2. Electronic Alignment Techniques

[redacted] will examine maximization of the effectiveness of the electronic system in obtaining the final results. STAT

a. It has been proven that electronic alignment provides accuracy superior to other means. The contractor will investigate simple modifications to the electronic system which would result in obtaining the greatest accuracy inherent in the basic technique. Versatility shall be increased by determining the optimum electronic characteristics to be used as a function of the dominant spatial frequencies in the image area which is to be enchanced.

b. All suitable oscilloscipes shall be examined and one shall be recommended for use with the correlator. [redacted] shall also determine the feasibility and cost of making the scope integral to the equipment. STAT

3. Operating Procedures

[redacted] shall establish sets of procedures for operating the equipment. STAT

4. Performance Specifications

From this experimental program, [redacted] shall synthesize performance specifications for equipment improvement and second generation devices in accordance with customer guidance pertaining to advanced operational and technical requirements. STAT

a. The basis for establishing such performance specifications lies in the evaluation of the present equipment for its inherent maximum capability, and the determination of optimum procedures to utilize best that capability. It is intended that these specifications provide for broadening the acceptable input range in terms of the definition of identity, decreasing the time required to complete an operation, improving reliability, etc.

b. A determination shall be made of the degree as to which servoed alignment and digital computation would enhance operation and accuracy.

B. Purpose

The purpose of the work described in the foregoing section shall be to improve the value of the present Mark I correlator equipment through thorough exploitation of its basic capabilities and through maximized operator performance. In addition, [redacted] shall determine performance specifications for suggested design changes in the Mark I and successive generation equipment, and for control of the manner in which photographs are taken which are intended for use in the correlator. Technical feasibility and the costs of changes and improvements will be provided in consultations with the Technical Representative of the Contracting Officer and in the reports. STAT

C. Technical Liaison

The Technical Representative of the Contracting Officer shall maintain continuous technical supervision including frequent liaison with the contractor's engineers at the equipment site. The basic limitations necessary to avoid establishing

C. Technical Liaison (cont'd.)

"impossible" problems shall be accomplished by early liaison, after which the Technical Representative shall supply the contractor with sets of identical photographic exposures which closely simulate likely operational problems. The Technical Representative may provide the "taking parameters" or withold them. In the latter instance the Technical Representative shall be responsible for integrating the contractor's evaluation with the "taking parameters" to effect complete correlation with specific operational problems.

D. Reports

The evaluation program shall be completed within six months from the time of authorization and supply of the initial sets of photographs. The first five months shall be devoted entirely to evaluation and portions of the sixth month shall be devoted entirely to evaluation, and portions of the sixth month shall be devoted to training one to two customer personnel on the equipment [ ] The STAT full-time project engineer conducting the program, plus another engineer drawn from the staff as needed shall perform specific technical tasks, including preparation of reports. The reports shall consist of:

1. Letter progress reports, in [ ] format, at the end of the second STAT and fourth months. These reports shall cover progress to date and specific accomplishments. They shall also indicate milestones and projected areas of work for the coming period.

2. Final Report. Summarized results of the investigation of the tasks indicated in the Scope of Work above.

3. Operator's Manual. Complete instructions and procedures for utilization of the Mark I Multiple Image Correlator in the range of input data supplied to [ ] and an evaluation of the results to be expected. STAT

4. Performance Specifications. Performance specifications for the Mark II equipment improvement and/or for an advanced image correlator incorporating those features agreed upon by the customer and [redacted] as technically obtainable and operationally desirable. (In the latter instance these performance specifications are proposed as an input to the preliminary design of the Multiple Image Correlator, Mark II.) STAT

5. Input Specifications. Source and sensor specifications useful to the customer for ascertaining the procurement of input material of the maximum effectiveness.

E. Shipping Instructions

Any items to be delivered under this Task Order shall be delivered FOB destination to whatever location within the continental limits of the United States as may be later stipulated by the Contracting Officer. GFE items are excluded from these shipping instructions.